Trends in
Ecology & Evolution

Series: Local and Indigenous ecological knowledge

Science & Society

Indigenous knowledge is saving our iconic species

Teagan Goolmeer [1,*] and Stephen van Leeuwen[2]

When a species' last strong foothold occurs on Country, empowering Indigenous-led actions under the collaborative management of culturally significant species is key to species persistence. We examine how Indigenous Australians are using Indigenous knowledge to save the greater bilby, a highly valued species to Indigenous and non-Indigenous Australians.

Collaborative management on Country

Collaborative management underpinned by shared decision-making is increasingly accepted as an effective tool to halt the decline and support the recovery of biodiversity [1]. Indigenous people are lobbying to mandate collaborative management of culturally significant entities (CSEs): species and ecological communities to which Indigenous peoples attribute cultural value and which are critical to their relationship with and adaptation to Country [2]. Country is the term used by Indigenous Australians to describe the lands, water, and seas to which they are connected. The term contains complex ideas about law, place, custom, language, spiritual belief, cultural practice, material sustenance, family, and identity [3].

Despite expectations about the positive outcomes for CSEs under collaborative management arrangements, real-world examples are scarce due largely to the lack of local Indigenous involvement in decision-making [1]. Further, there is a lack of quantitative data that supports the benefits of Indigenous-led actions for CSEs, which is challenging as biodiversity managers and policymakers often need to justify species management and threat abatement actions with quantitative evidence-based data [1]. The challenge lies in reaching a balance between the application of Western science and Indigenous knowledge to achieve a genuine collaborative management approach. Notably, managers and policymakers must recognise that Indigenous peoples are the custodians of a knowledge system that contains a detailed awareness of the processes that control the distribution of biodiversity and that influence the condition of the environment [2].

We explore an Australian case study evaluating the recovery efforts for the greater bilby (*Macrotis lagotis*). We propose the need for systemic change to support collaborative management of CSEs and to further empower Indigenous managers of land, water, and sea Country.

Case study – the greater bilby

The greater bilby is the last surviving desert bandicoot. Once found across more than three quarters of the Australian mainland, its range has retracted by more than 80%, with more than 70% of the extant distribution found on land owned and/or managed by Indigenous Australians (Figure 1A) [4,5]. Key threats impacting the persistence of the bilby are directly related to colonisation and the disruption to traditional land management practices inherent in the dispossession and displacement of people from Country, including habitat loss and fragmentation, introduced predators, altered fire regimes, and the impacts of domestic and feral animals [4,5].

The bilby is listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and as Endangered on the IUCN's Red List of Threatened Species [5]. The bilby's conservation status is well understood in Australia where this medium-size burrowing marsupial (Figure 1B) has become the iconic Australian version of the 'Easter Bunny' and the only Australian animal with an official gazetted day [6]. Identified as a flagship species for arid zone conservation, saving the bilby from extinction will help conserve critically important ecosystems and other native species [5,6].

While the public understands the intrinsic values of saving the bilby from extinction, most would not recognise its immense cultural value and spiritual importance to Indigenous Australians. The bilby is an integral part of Indigenous culture, lore, and custom, and was once an important source of protein [7]. The bilby's cultural significance links vast parts of Australia through song lines, stories, and ceremony, with each Indigenous group having their own unique connection to this species [8]. Importantly, Indigenous Australians hold knowledge of the ecology, distributions, and the reason for and timelines of decline, which Western science is yet to fully understand [8].

The existing National Recovery Plan for the Greater Bilby (2006) [5] attempts to articulate the significant role Indigenous Australians play in its management and recovery; however, it does not recognise the importance of a collaborative management approach. Instead, it takes a paternalistic approach, as Indigenous Australians are relied upon to undertake surveying, monitoring, and threat mitigation actions on Country to bolster employment opportunities, rather than investing in the cultural wellbeing and empowerment of Indigenous Australians to continue their ongoing stewardship of Country.

The inappropriateness of the Western science approach articulated in the 2006 Recovery Plan is obvious in its

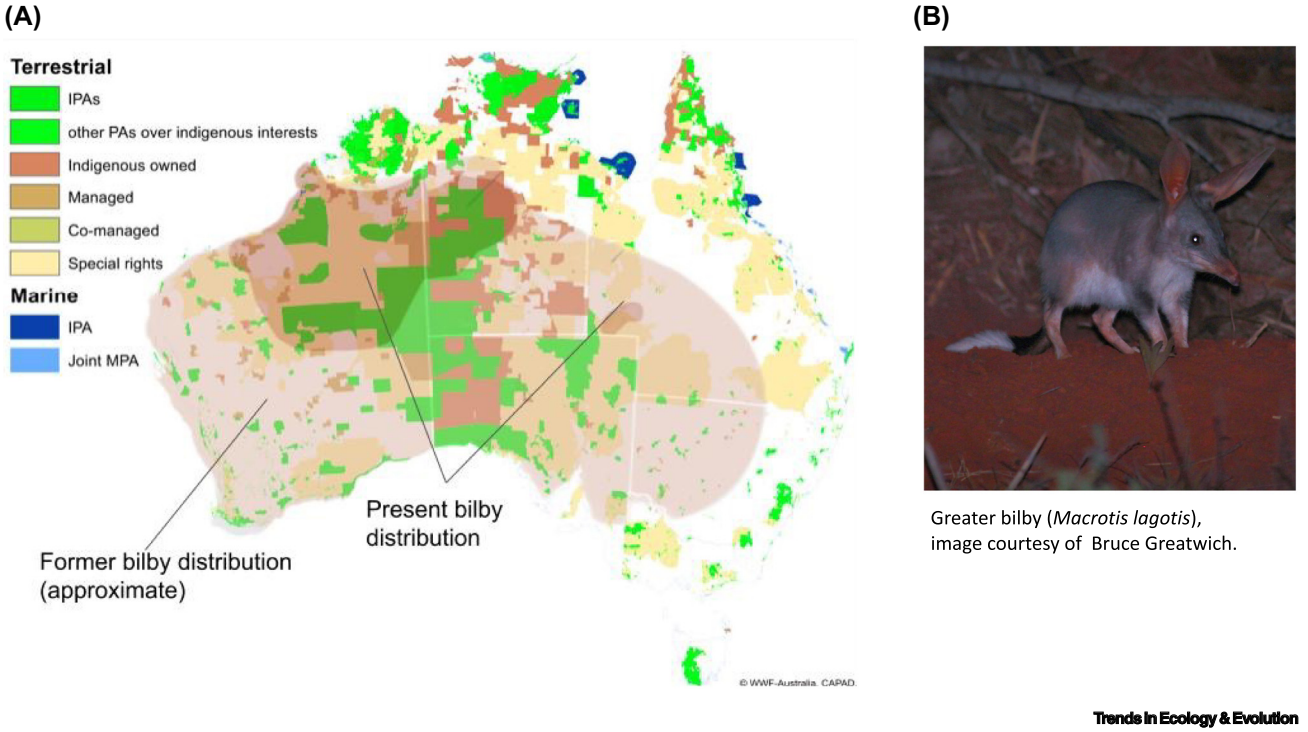

Figure 1. The greater bilby and its distribution on Indigenous managed and owned Country. Abbreviations: IPA, Indigenous Protected Area; MPA, Marine Protected Area; PA, Protected Area. Adapted from Figure 17 in [9] and Figure 1.2 in [10] with permission.

rigid recommendations for some of the recovery actions. For example, the use of baiting to manage feral predators is contentious and in conflict with the aspiration of many Indigenous Australian communities. Instead of designing an inclusive solution that addresses the concerns of Indigenous Australians, it offers 'effective education on the impacts of cats and foxes' [6] as a means to achieving agreement to baiting. This action fails to understand that baiting in remote communities presents both a health and cultural risk, as many Indigenous Australians practice customary take of cats (*Felis catus*) and foxes (*Vulpes vulpes*) as replacement sources of protein [8]. Furthermore, the impacts of baiting on the dingo (*Canis familiaris*) are not acknowledged, and this is a CSE which many communities desire to maintain. Similarly, the recovery plan favours quantitative data on the distribution and population status of the bilby over local Indigenous knowledge.

More recently, researchers, policymakers, and conservation groups have partnered with Indigenous Australians supporting Indigenous-led actions to halt decline and support recovery [10]. The 2019 Draft recovery plan [5] addresses the need to support actions that promote a role for Indigenous Australians, and to provide governance and coordination.

Table 1 outlines some of the Indigenous-led actions already under way for bilby recovery occurring across Country. Notably track-based monitoring and population mapping using Indigenous knowledge are actions that showcase the 'right way science' approach which ensures the meaningful integration of Indigenous knowledge with Western science methodologies. Through this approach, Indigenous Australians are realising their aspirations and valuing the monitoring process which now reflects their knowledge systems and ways of working [7,8]. Table 1 also suggests some potential ways to integrate Indigenous into the recovery plan, noting that these are the perspectives of the authors, and that such integration would require extensive engagement and participation of Indigenous groups across the Country.

National stakeholder engagement forums – such as the Indigenous bilby festival – also offer an opportunity for Indigenous Australians to share their knowledge and concerns for the bilby and ultimately to redesign the national bilby monitoring programme [7,8,11]. While we wait for quantitative data to confirm the benefits of developing a collaborative management approach, policymakers and managers are seeking opportunities to meaningfully integrate Indigenous knowledge into the recovery of this flagship species [4,12], a positive outcome promoted by the revised draft 2019 national recovery plan [5].

Table 1. Indigenous-led conservation actions for the greater bilby (*Macrotis lagotis*)

Conservation objective	Current Indigenous-led action, not supported by the recovery plan	Potential integration of Indigenous knowledge into the recovery plan
Bilby monitoring	Population mapping using traditional ecological knowledge Track-based monitoring Integration of traditional and Western monitoring methods	Support the establishment and implementation of Indigenous-led monitoring methodology
Predator control	Traditional tracking and hunting Customary take: rabbit (*Oryctolagus cuniculus*)/cat (*Felis catus*)	Support Indigenous groups using traditional tracking and hunting methods to control cats/rabbits
Landscape management	Song line/cultural corridor management Cultural site management Habitat identification Traditional fire regime	Encourage the use of Indigenous-led traditional fire management across the arid zone Support the Indigenous-led mapping and management of cultural sites and corridors
Stakeholder engagement	Community gatherings Cultural exchange Knowledge sharing and intergenerational storytelling Language capture	Establish and support an Indigenous ranger network across the arid zone, with opportunities for cultural exchanges and knowledge sharing

Realising the potential of collaborative management

The cultural importance for all species/communities should be considered in the development of conservation strategies, and Indigenous people should have the authority to participate in decision-making to manage species/communities [1]. Empowerment of Indigenous people in collaborative management is possible if an all-of-system approach is taken: that involves Indigenous people in the decision-making process from the nomination stage through to the development and implementation of conservation plans which articulates the on-ground recovery actions required [2,13]. Equally it is important to recognise that CSE collaborative management should take an ecosystem-based approach, as traditional management emphasizes the importance of a holistic, integrated approach to safeguarding species/communities of cultural significance [1,2].

Not only does collaborative management align with the aspirations of Indigenous people, it also offers a tangible hook for policymakers and conservation practitioners to integrate Indigenous knowledge into biodiversity management strategies, threat abatement plans, and associated implementation mechanisms [2].

To realise the potential of collaborative management, sweeping reforms will be required. Fortunately, this is an opportunistic period globally as we progress towards the adoption of the Post-2020 Biodiversity framework. The framework acknowledges the need to ensure meaningful participation of Indigenous people in biodiversity conservation, and specifically in Target 9: the need to protect customary sustainable use of biodiversity by Indigenous people [14]. This international framework should challenge governments to rethink how they approach biodiversity strategies, conservation planning, policy, and legislation.

In Australia, the EPBC Act is the key environmental legislation to ensure that Australia meets its international obligations. The 2020 EPBC Act review found the need to better recognise the importance of Indigenous knowledge, requiring all decision-makers to respectfully consider Indigenous views and knowledge [15]. The review also recommended reforms to demonstrate how Indigenous knowledge is considered in decision-making via the Act, and to establishing a national environmental standard for Indigenous engagement and participation in decision-making [15]. While these reforms have yet to be adopted, if recommendations are implemented to leading practice and codesigned with Indigenous Australians there will be a greater emphasis on Indigenous-led actions [13].

Constructively, Australian policymakers are not waiting for reform to improve Indigenous decision-making mandates in strategic biodiversity plans. The recently released Threatened Species Strategic Action Plan [14] recognises the need to strengthen relationships with Indigenous Australians and has set the ambitious target of proactively engaging Indigenous Australians in the preparation of all EPBC Act conservation planning documents for culturally significant threatened species and ecological communities by 2026 [16]. Innovative policy development with accountability is promising for the collaborative management of CSEs; however, implementation of the target must be flexible and adaptative to a place-based approach and to ensure that the integration of Indigenous knowledge does not impact on the customary sustainable use of resources [2].

Finally, any collaborative management approach must consider how they will empower Indigenous governance structures. In the Australian context, over many years of building mutually beneficial partnerships with Indigenous Australians, key lessons have been conveyed about the devolution of power, including prioritizing mutual benefits and reciprocity, knowledge sharing and project development, maintenance of Indigenous cultural and intellectual property, Indigenous empowerment, and two-way capacity building [17].

Empowering Indigenous-led management

Species conservation and recovery will generate direct and indirect ecological, cultural, social, and economic benefits. It is imperative that genuine collaborative management approaches are implemented to empower Indigenous people to make decisions for their Country and realise their aspirations for the species/communities that they have maintained stewardship of for millennia.

Declaration of interests

No interests are declared.

[1]School of Ecosystem and Forest Science, University of Melbourne, Melbourne, Victoria, 3052, Australia
[2]School of Molecular and Life Sciences, Curtin University, Perth, Western Australia

*Correspondence:
tgoolmeer@gmail.com (T. Goolmeer).

https://doi.org/10.1016/j.tree.2023.03.010

© 2023 Elsevier Ltd. All rights reserved.

References

1. Freitas, C.T. *et al.* (2020) Co-management of culturally important species: a tool to promote biodiversity conservation and human well-being. *People Nat.* 2, 61–81
2. Goolmeer, T. *et al.* (2022) Recognizing culturally significant species and Indigenous-led management is key to meeting international biodiversity obligations. *Conserv. Lett.* 15, e12899
3. Australian Institute of Aboriginal and Torres Strait Islander Studies (2022) Welcome to Country [Online]. https://aiatsis.gov.au/explore/welcome-country
4. Threatened Species Scientific Committee (2016) *Conservation Advice Macrotis lagotis greater bilby. Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth of Australia
5. Commonwealth of Australia (2019) *Recovery plan for the greater bilby (Macrotis lagotis)*, DRAFT, Commonwealth of Australia
6. Pavey, C. (2006) *National recovery plan for the greater bilby Macrotis lagotis*, Department of Natural Resources, Environment and the Arts, Northern Territory
7. Legge, S. *et al.* (2018) *Monitoring Threatened Species and Ecological Communities*, CSIRO Publishing
8. Skroblin, A. *et al.* (2022) Developing a two-way learning monitoring program for mankarr (greater bilby) in the Western Desert, Western Australia. *Ecol. Manag. Restor.* 23, 129–138
9. Taylor, M.F.J. (2017) *Building nature's safety net 2016: state of Australian terrestrial protected areas 2010–2016*, WWF Australia
10. Department of Biodiversity, Conservation and Attractions (2021) *Monitoring, mapping and safeguarding Kimberley bilbies*, DBCA, Western Australia
11. Hausheer, J.E. (2017) Traditional knowledge helps monitor threatened bilbies on Martu Country. *Cool Green Science* https://blog.nature.org/2017/07/17/traditional-knowledge-helps-monitor-threatened-bilbies-on-martu-country/
12. Bradley, K. *et al.* (2015) *2015 Greater bilby conservation summit and interim conservation plan: an initiative of the Save the Bilby Fund*, IUCN SSC Conservation Breeding Specialist Group, Apple Valley, MN
13. Goolmeer, T. *et al.* (2022) Getting our act together to improve Indigenous leadership and recognition in biodiversity management. *Ecol. Manag. Restor.* Published online January 28, 2022. https://doi.org/10.1111/emr.12523
14. CBD (2020) *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework; Zero Draft of the Post-2020 Global Biodiversity Framework Convention on Biological Diversity*.
15. Samuel, G. (2020) *Independent Review of the EPBC Act – Final Report*, Commonwealth of Australia, Department of Agriculture, Water and the Environment
16. DAWE (2022) *Threatened Species Strategy Action Plan 2021–2026*, Australian Government, Department of Agriculture, Fisheries & Forestry
17. Ens, E.J. and Turpin, G. (2022) Synthesis of Australian cross-cultural ecology featuring a decade of annual Indigenous ecological knowledge symposia at the Ecological Society of Australia conferences. *Ecol. Manag. Restor.* 23, 3–16